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# Four new records of *Haematomma* from Southern China

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Abstract—*Haematomma accolens*, *H. collatum*, *H. fenzlianum*, and *H. flexuosum* are reported as new for China; and *H. fenzlianum* is also new for Asia. Detailed taxonomic descriptions with photos are provided for the four species.

Key words—East Asia, *Haematommataceae*, *Lecanorales*, lichenized *Ascomycota,* taxonomy

## Introduction

*Haematomma* A. Massal., introduced by Massalongo in 1852, is a genus of crustose lichens with blood-red apothecia having thallus-coloured margins and transversely septate to muriform ascospores. For the most part, species of *Haematomma* are found in the tropics and subtropics (Staiger & Kalb 1995, Brodo & al. 2008), so it is not surprising that in China *Haematomma* is mainly distributed in the southern provinces, where the terrain is diverse with plains, basins, and plateaus, dominated by tropical subtropical monsoon climate and with high temperatures and abundant rain in summer and mild temperatures with less rain in winter. With its diverse climate types (tropical, subtropical, temperate, and cold temperate) and plant ecosystems (tropical rain forest, evergreen broadleaf forest, deciduous broadleaf forest, coniferous forest, meadow, desert, etc.), and altitudes of 72–6740 m, Yunnan Province has an especially rich range of lichen species.

[#] Rong Tang & Xiao Zhang contributed equally to this research.

In the world monograph of *Haematomma* by Staiger & Kalb (1995), only one species is mentioned as occurring in China: *H. rufidulum* (Fée) A. Massal. Previously, *H. fauriei* Zahlbr. and *H. puniceum* (Ach.) A. Massal. had been recorded from China (Zahlbruckner 1930, Xu 1989), but as we have been unable to find any specimens of these two species to verify the reports, we cannot confirm their Chinese occurrence. Since 1995, four other species have been added to the Chinese list: *H. africanum* (J. Steiner) C.W. Dodge, *H. caperaticum* Brodo & al., *H. persoonii* (Fée) A. Massal., and *H. wattii* (Stirt.) Zahlbr. (Wei 1991, Aptroot & Sparrius 2003, Obermayer 2004, Tang & al. 2018), to which we here add another four species: *H. accolens*, *H. collatum*, *H. fenzlianum*, and *H. flexuosum* based primarily on recently collected material from Southern China. Hopefully, this paper will provide the basis for further research.

## Materials & methods

The specimens studied are housed in: Lichen Section of the Botanical Herbarium, Shandong Normal University (SDNU); Kunming Institute of Botany, Chinese Academy of Sciences (KUN-L); Sectio Lichenum, Herbarium Mycologici Academiae Sinicae (HMAS-L); and Lichen Herbarium of the College of Life Sciences, Liaocheng University (LCU). The macro- and micromorphological characters of the specimens were examined under an Olympus SZ51 stereomicroscope and Olympus CX21 polarizing microscope. Both thallus and medulla were tested with K (a 10% aqueous solution of potassium hydroxide) and C (a saturated solution of aqueous sodium hypochlorite). The lichen substances were identified using standardized thin layer chromatography techniques (TLC) with solvent system C (Orange & al. 2010). Photos of the voucher specimens were taken under Olympus SZX16 and BX61 with DP72.

## Taxonomic descriptions

***Haematomma accolens*** (Stirt.) Hillmann,
Repert. Spec. Nov. Regni Veg. 49: 34 (1940) Fig. 1a–e

Thallus crustose, smooth or roughened, slightly cracked, without isidia or soredia, pale yellowish white; prothallus present, white. Apothecia red, sessile or constricted at base, dispersed or crowded, smooth, epruinose, 0.4–1.0 mm diam., margin distinct, smooth; epihymenium orange-red, K+ purple, dissipating; hymenium hyaline, 75–90 µm tall; hypothecium hyaline; asci clavate, 8-spored; ascospores persistently colorless, parallel in ascus, several-septate, fusiform, with 7–12 cells in optical view, 38–60 × 3–4(–5) µm. Pycnidia: not observed.

Chemistry—Cortex and medulla K+ yellow, C–, KC–, IKI–. Atranorin, placodiolic acid, and haematommone detected by TLC.

Habitat—Growing on the bark of shrubs trees (e.g., *Betula* and *Michelia*) at elevations of 400–1230 m and in China usually growing together with *Phaeographis* spp..

Distribution—North, Central, and South America, Africa, Australia, Asia (Staiger & Kalb 1995, Brodo & al. 2008). New to China.

Specimens examined: **CHINA**. **Guangdong**, **Shixing**, Lulang, Che eight Ling National Nature Reserve, alt. 400 m, on bark, 14 May 2015, Zefeng Jia GD15156 (LCU); **Yunnan**, **Dali Co.**, Nanjian, Gonglang Village, Yangjiehe, alt. 1230 m, on bark, 15 Jun. 2012, Wang Li-song, Wang Xin-yu & Liu Dong 12–34410A, 12–34410C (KUN-L).

Comments—*Haematomma accolens* is characterized by the 7–12-celled ascospores and K+ purple epihymenium. The description of the Chinese material is similar to previously published descriptions of *H. accolens,* although Brodo & al. (2008) reported the spores with (5–)6–8(–12) cells. *Haematomma accolens* is morphologically similar to *H. flexuosum*, but they have a different chemistry: *H. accolens* contains atranorin, placodiolic acid, and haematommone, whereas *H. flexuosum* contains atranorin, isoplacodiolic acid, isopseudoplacodiolic acid, and haematommone.

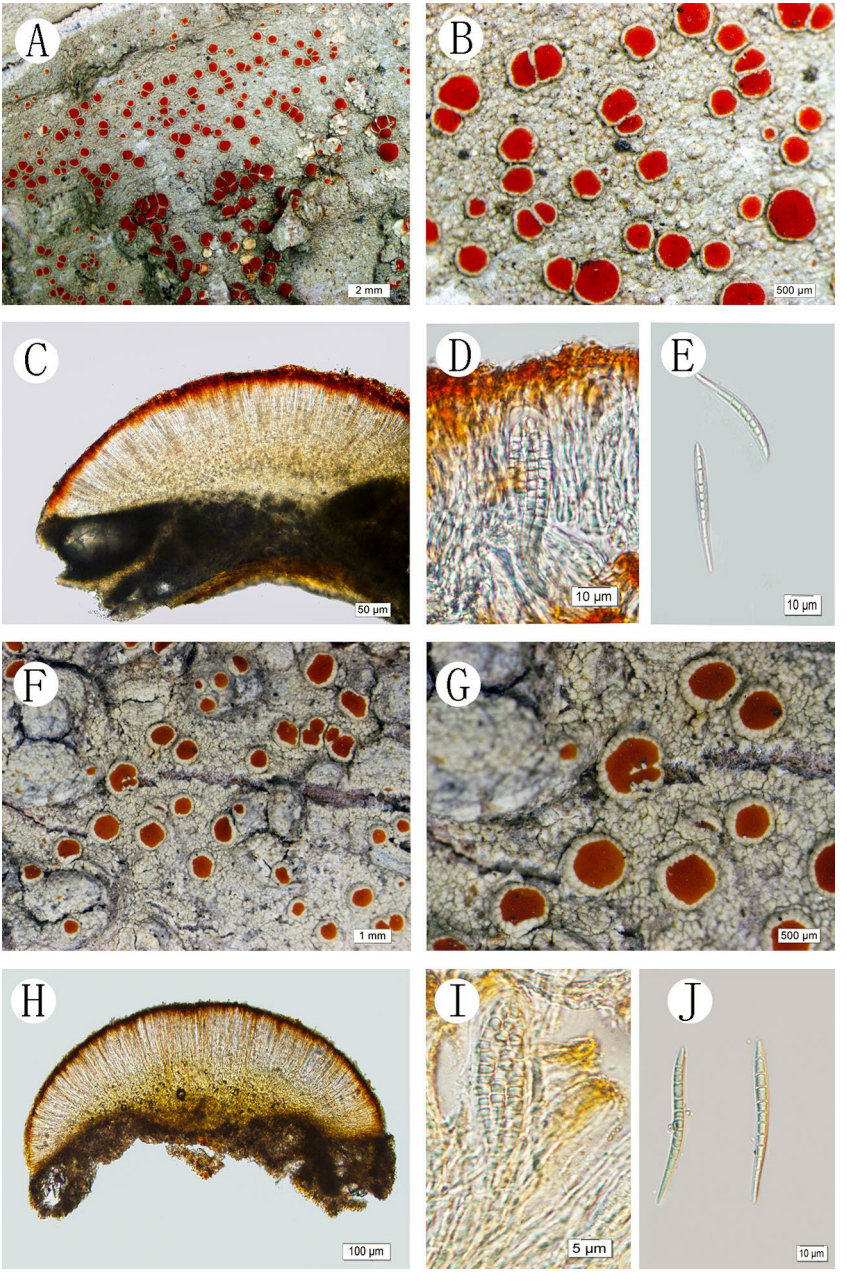
***Haematomma collatum*** (Stirt.) C.W. Dodge,
Beih. Nova Hedwigia 38: 41 (1971) Fig. 1f–j

Thallus crustose, continuous, rugose or rimose, without isidia or soredia, yellowish white; prothallus usually present, white. Apothecia rounded, orange-red, sessile or constricted at base, dispersed, smooth, (0.5–)0.8–1.5 mm diam., margin distinct, crenulate, usually prominent above disk; epihymenium orange to orange-red, K+ red; hymenium hyaline, 80–95 µm tall; hypothecium hyaline or slightly yellowish, K–; paraphyses branched and anastomosing; asci clavate, 8-spored; ascospores persistently colorless, twisted in ascus, multiseptate, fusiform, curved, with 10–14 cells in optical view, locules sometimes not equal in size, the tail cell longer than middle cells, (53–)65–75 × 4–5 µm. Pycnidia: not observed.

Chemistry—Cortex and medulla K+ yellow, C–, KC–, IKI–. Atranorin, sphaerophorin, isosphaeric acid (minor), and russulone detected by TLC.

Habitat—Growing on bark at elevations of 670–2500 m. The specimen from Yunnan was found in a moist evergreen broadleaf forest; compared with other *Haematomma* spp. in this area, *H. collatum* grows very well. We also find that, in China, *H. collatum* likes to grow in the same environment as lichens in the *Graphidaceae*.

Distribution—Central and South America, Africa, Australia, Asia Minor (Staiger & Kalb 1995; Brodo & al. 2008). New to China.


A
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B
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C
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D
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E
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G
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100 µm
I
5 µm
J
10 µm

Specimens examined: **CHINA**. **Yunnan**, **Jingdong**, Mt. Ailao, 24°32′29″N 101°01′37″E, alt. 2500 m, on bark, 5 Aug. 2017, R. Tang & al. 20170319 (SDNU); **Hainan**, **Mt. Wuzhi**, 18°46′N 109°31′E, alt. 670 m, on bark, 28 Jun. 2008, Jia Zefeng. 119392 (HMAS-L).

Comments—*Haematomma collatum* can be characterized by its crenulate apothecial margins, 10–14-celled ascospores, medullary sphaerophorin, and epithecial russulone. The Chinese material closely matches previously published descriptions (Staiger & Kalb 1995). This species and *H. persoonii* contain the same chemical substances, but *H. persoonii* has ascospores with fewer (6–8) cells (Brodo & al. 2008).

***Haematomma fenzlianum*** A. Massal.,
Mem. Reale Ist. Veneto Sci. 10: 58 (1861) Fig. 2a–e

Thallus thick, crustose, rugose or rimose, areolate, without isidia or soredia, dull yellowish white; prothallus not seen. Apothecia rounded, deep reddish, sessile or constricted at base, dispersed, smooth, epruinose, 0.5(–0.8)–2.0 mm diam., margin distinct, crenulate or flexuose, usually prominent above disk; epihymenium orange-red, K+ red; hymenium hyaline, 70–75 µm tall; hypothecium hyaline or pale yellowish; asci clavate, 8-spored; ascospores persistently colorless, multiseptate, fusiform, straight or slightly curved, with (3–)4–7 cells in optical view, (30–)33–43(–48) × 4.5–5 µm. Pycnidia: not observed.

Chemistry—Cortex and medulla K+ yellow, C–, KC–. Atranorin, sphaerophorin, isosphaeric acid, and russulone detected by TLC.

Distribution—Europe, Africa, Australasia, America (Staiger & Kalb 1995, Nash & al. 2004, Brodo & al. 2008). New to China, and new to Asia.

Habitat—Growing on non-calcareous rock. *Haematomma fenzlianum* has rarely been collected in China, probably because it likes to grow in dry exposed areas, such as those occurring in North America and Argentina; comparable habitats are rare in southern China.

Specimen examined: **CHINA**. **Yunnan**, **Lijiang**, Yupang, alt. 2600 m, on rock, 15 Aug. 1982, Wang Li-song 82–1081 (KUN-L).

Comments—*Haematomma fenzlianum* is characterized by its thick thallus and 4–7-celled ascospores, and by its substrate. The Chinese material

Fig. 1. ***Haematomma accolens*** (LCU-L Jia GD15156). A. Thallus; B. Apothecium; C. Apothecium section; D. Ascus; E. Ascospores. ***Haematomma collatum*** (HMAS-L Jia 119392). F. Thallus; G. Apothecium; H. Apothecium section; I. Ascus; J. Ascospores.

closely matches previously published descriptions (Staiger & Kalb 1995). *Haematomma fenzlianum* is the only saxicolous species of *Haematomma* in China. *Haematomma ochroleucum* (Neck.) J.R. Laundon is also saxicolous but differs in containing zeorin and being abundantly sorediate (vs. *H. fenzlianum* which lacks zeorin and (usually) soredia).

***Haematomma flexuosum*** Hillmann,
Repert. Spec. Nov. Regni Veg. 49: 35 (1940) Fig. 2F–J

Thallus crustose, continuous, rugose or rimose, roughened, without isidia or soredia, yellowish white; prothallus present, white. Apothecia rounded, deep reddish, sessile or constricted at base, dispersed, smooth, 0.4–0.8 mm diam., margin distinct, even with disk; epihymenium red, K+ purple, dissipating; hymenium hyaline, 63–70 µm tall; hypothecium hyaline or pale yellowish, K–; paraphyses branched and anastomosing; asci clavate, 8-spored; ascospores persistently colorless, multiseptate, fusiform, curved or straight, with 5–7 cells in optical view, (35–)50–63 × 4–5 µm. Pycnidia: not observed.

Chemistry—Cortex and medulla K+ yellow, C–, KC–. Atranorin, isoplacodiolic acid, isopseudoplacodiolic acid, and haematommone detected by TLC.

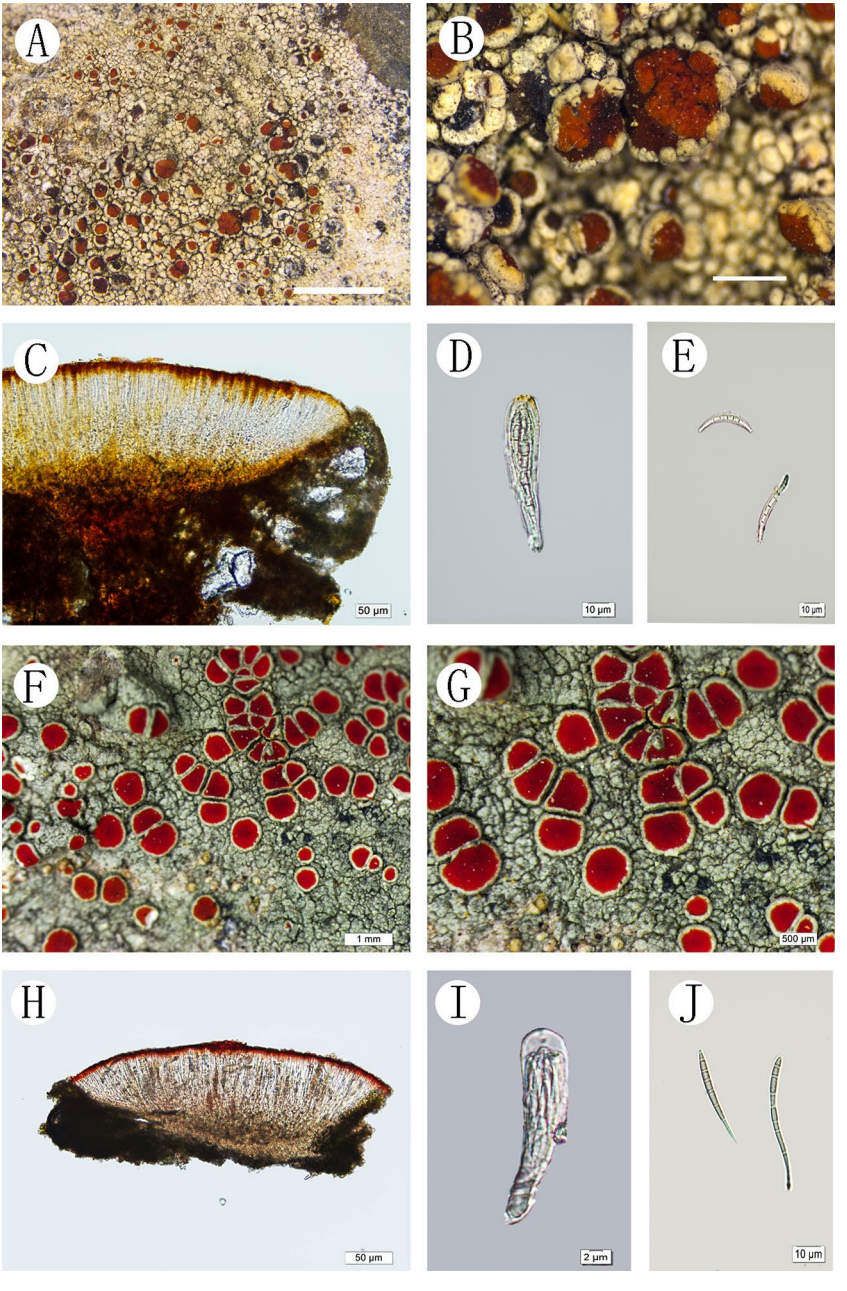
Distribution—Central and South America, Africa, Australia, West Indies (Staiger & Kalb 1995; Brodo & al. 2008). New to China.

Habitat—Growing on bark around 1000 m above sea level. We found this species growing together with *H. rufidulum*.

Specimens examined: **CHINA**. **Yunnan**, **Najian**, Mt. Manhai, 24°42′57″N 100°25′17″E, alt. 1266 m, on bark, 30 Jun. 2015, X. Ye & W.C. Wang 15–47956(A), 15–47956(D) (KUN-L). **Yunnan**, **Luxi**, Mt. Santai, 24°26′N 98°35′E, alt. 1340 m, on bark, 28 Jun. 1980, Jiang Yu-mei 051540 (HMAS-L).

Comments—*Haematomma flexuosum* is characterized by 5–7-celled ascospores and by its special chemistry. The Chinese material closely matches the description by Staiger & Kalb (1995). *Haematomma matogrossense* Kalb & Staiger is similar but differs by having 8–14-celled spores and by containing methylisopseudoplacodiolic acid and isopseudoplacodiolic acid (rather than 5–7 cells and isoplacodiolic acid and isopseudoplacodiolic acid in *H. flexuosum*).

Fig. 2. ***Haematomma fenzlianum*** (KUN-L Wang 82-1081). A. Thallus; B. Apothecium; C. Apothecium section; D. Ascus; E. Ascospores. ***Haematomma flexuosum*** (KUN-L Ye 15–47956(D)). F. Thallus; G. Apothecium; H. Apothecium section; I. Ascus; J. Ascospores. Scale bars: A = 5 mm; B = 1 mm.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